

WHAT IS CLAIMED IS:

1. A corrosion-inhibited fire retardant composition comprising:

at least one fire retardant composition comprised of at least one ammonium polyphosphate;

at least one suspending agent;

at least one phosphonate selected from a group consisting of aminotri(methylenephosphonic acid), 1-hydroxyethylidene-1,1-diphosphonic acid, hexamethylenediaminetetra(methylenephosphonic acid), diethylenetriaminepenta(methylenephosphonic acid), and salts thereof, and mixtures thereof; and

a corrosion inhibiting system comprised of at least one corrosion inhibiting compound selected from a group of corrosion inhibiting compounds consisting of azoles, insoluble ferric pyrophosphate, soluble ferric pyrophosphate, ferrous oxalate, ferric citrate, ferrous sulfate, ferric ammonium citrate, insoluble ferric orthophosphate, soluble ferric orthophosphate, ferric ammonium oxalate, ferric ammonium sulfate, ferric bromide, ferric sodium oxalate, ferric stearate, ferric sulfate, ferrous acetate, ferrous ammonium sulfate, ferrous bromide, ferrous gluconate, ferrous iodide, ferric acetate, ferric fluoroborate, ferric hydroxide, ferric oleate, ferrous fumarate, ferrous oxalate, ferrous oxide, ferric lactate, ferric resinate, and any combination thereof;

wherein said corrosion inhibiting system is present in a minor amount effective to substantially reduce corrosiveness of said fire retardant composition.

2. The composition of claim 1 wherein said azole is at least one azole selected from a group of azoles including tolytriazole, benzotriazole, mercaptobenzothiazole, dimercaptomthiadiazole, 1,2 benzisothiazoline-3-1, 2-benzimidazolone, 4,5,6,7-

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tetrahydrobenzotriazole, tolylimidazole, 2-(5-ethyl-2-pyridyl) benzimidazole, phthalimide, any alkali metal salts thereof and combinations thereof.

3. The composition of claim 1 further comprising at least one additive selected from a group of additives consisting of coloring agents, surfactants, stabilizers, rheological modifiers, opacifying pigments and any combination thereof.

4. The composition of claim 1 wherein said corrosion inhibitor is at least one azole and said azole is present in said corrosion-inhibited fire retardant composition, in concentrate, in a minor amount effective to obtain a maximum corrosivity of yellow brass to a maximum of 5.0 mils per year, as determined by the "Uniform Corrosion" test set forth in Section 4.5.6.1 of "Specification 5100-304b (January 2000) Superseding Specification 5100-00304a (February 1986)," entitled "Specification for Long Term Retardant, Wildland Fire, Aircraft or Ground Application," issued by the United States Department of Agriculture, Forest Service.

5. The composition of claim 3 wherein said coloring agent is at least one selected from a group consisting of fugitive coloring agents, non-fugitive coloring agents and pigments, extenders, opacifying pigments, and other highly colored coloring agents.

6. The composition of claim 1 wherein said suspending agent is at least one suspending agent selected from a group consisting of Attapulugus, Sepiolite, Fuller's earth, Montmorillonite, and Kaolin clays.

7. The composition of claim 1 wherein said corrosion inhibiting system is comprised of at least one soluble corrosion inhibiting compound and at least one insoluble corrosion inhibiting compound.

8. The composition of claim 1 wherein said corrosion inhibiting system is present in a minor amount effective in said corrosion-inhibited fire retardant composition, in concentrate, to obtain at least one of a maximum corrosivity to aluminum of 5.0 mils per year, yellow brass to

5.0 mils per year, and steel to 5.0 mils per year, as determined by the "Uniform Corrosion" test set forth in Section 4.5.6.1 of "Specification 5100-304b (January 2000) Superseding Specification 5100-00304a (February 1986)," entitled "Specification for Long Term Retardant, Wildland Fire, Aircraft or Ground Application," issued by the United States Department of Agriculture, Forest Service.

9. The composition of claim 1 further comprising water.

10. The composition of claim 1 comprising in the range of about .01% to about 10% of said corrosion inhibiting system.

11. The composition of claim 1 comprising in the range of about .30% to about 6.0% of said corrosion inhibiting system.

12. The composition of claim 1 comprising in the range of about 0.6% to about 5.0% of said corrosion inhibiting system.

13. The composition of claim 1 wherein said phosphonate is aminotri(methylenephosphonic acid), or a salt thereof.

14. The composition of claim 1 wherein said phosphonate is pentasodium aminotri(methylenephosphonic acid).

15. The composition of claim 1 wherein said phosphonate is 1-hydroxyethylidene-1,1-diphosphonic acid, or a salt thereof.

16. The composition of claim 1 wherein said phosphonate is tetrasodium 1-hydroxyethylidene-1,1-diphosphonic acid.

17. The composition of claim 1 wherein said phosphonate is hexamethylenediaminetetra(methylenephosphonic acid), or a salt thereof.

18. The composition of claim 1 wherein said phosphonate is hexapotassium hexamethylenediaminetetra(methylenephosphonic acid).

19. The composition of claim 1 wherein said phosphonate is diethylenetriaminepenta(methylenephosphonic acid), or a salt thereof.
20. The composition of claim 1 wherein said phosphonate is hexasodium diethylenetriaminepenta(methylenephosphonic acid).
21. The composition of claim 1 wherein at least one phosphonate comprises less than about 10% by weight of said composition, based on total ammonium polyphosphate composition.
22. The composition of claim 1 wherein at least one phosphonate comprises in the range of about 1% to about 10% by weight of said composition, based on total ammonium polyphosphate composition.
23. The composition of claim 1 wherein at least one phosphonate comprises about 4.35% by weight of said composition based on total ammonium polyphosphate composition.
24. The composition of claim 3 wherein said rheological modifying agent is at least one selected from a group consisting of guar gum, derivatized guar gum and xanthan gum.
25. A method of preparing a corrosion-inhibited fire retardant composition, adapted for application to wildland fires, the method comprising the steps of:
 - (a) forming an intermediate concentrate composition comprising the corrosion-inhibited fire retardant composition of claim 1; and
 - (b) diluting said intermediate concentrate with water to form said corrosion-inhibited fire retardant composition.
26. The method of claim 25 wherein said azole is at least one azole selected from a group of azoles including tolytriazole, benzotriazole, mercaptobenzothiazole, dimercaptomthiadiazole, 1,2 benzisothiazoline-3-1, 2-benzimidazolone, 4,5,6,7-tetrahydrobenzotriazole, tolylimidazole, 2-(5-ethyl-2-pyridyl) benzimidazole, phthalimide, any alkali metal salts thereof and combinations thereof.

27. The method of claim 25 wherein said corrosion inhibiting system is comprised of at least one soluble corrosion inhibiting compound and at least one insoluble corrosion inhibiting compound.

28. The method of claim 25 wherein said intermediate concentrate composition further comprises at least one additive selected from a group of additives consisting of coloring agents, surfactants, stabilizers, rheological modifiers, opacifying pigments and any combination thereof.

29. The method of claim 25 wherein said corrosion inhibiting system comprises at least one azole and said azole is present in said corrosion-inhibited fire retardant composition, in concentrate, in a minor amount effective to obtain a maximum corrosivity of yellow brass to 5.0 mils per year, as determined by the "Uniform Corrosion" test set forth in Section 4.5.6.1 of "Specification 5100-304b (January 2000) Superseding Specification 5100-00304a (February 1986)," entitled "Specification for Long Term Retardant, Wildland Fire, Aircraft or Ground Application," issued by the United States Department of Agriculture, Forest Service.

30. The method of claim 25 wherein said corrosion inhibiting system is present in a minor amount effective to reduce the corrosiveness of said fire retardant composition, in concentrate, to at least one of a maximum corrosivity of aluminum to 5.0 mils per year, brass to 5.0 mils per year, and steel to 5.0 mils per year, as determined by the "Uniform Corrosion" test set forth in Section 4.5.6.1 of "Specification 5100-304b (January 2000) Superseding Specification 5100-00304a (February 1986)," entitled "Specification for Long Term Retardant, Wildland Fire, Aircraft or Ground Application," issued by the United States Department of Agriculture, Forest Service.

31. The method of claim 25 wherein said intermediate concentrate composition is diluted such that a maximum corrosivity of aluminum is 2.0 mils per year and the maximum corrosivity of

brass and steel is 2.0 mils per year when tested in the totally immersed condition and 5.0 mils per year when tested in the partially immersed condition, as specified and determined by the "Uniform Corrosion" test set forth in Section 4.5.6.1 of "Specification 5100-304b (January 2000) Superseding Specification 5100-00304a (February 1986)," entitled "Specification for Long Term Retardant, Wildland Fire, Aircraft or Ground Application," issued by the United States Department of Agriculture, Forest Service.

32. The method of claim 28 wherein said coloring agent is at least one coloring agent selected from a group of coloring agents consisting of fugitive coloring agents, non-fugitive coloring agents and pigments, extenders, opacifying pigments, and other highly colored coloring agents.

33. The method of claim 25 wherein said suspending agent is at least one suspending agent selected from a group of suspending agents consisting of Attapulugus clay, Sepiolite, Fuller's earth, Montmorillonite, and Kaolin clays.

34. The method of claim 25 wherein said phosphonate is aminotri(methylenephosphonic acid), or a salt thereof.

35. The method of claim 25 wherein said phosphonate is pentasodium aminotri(methylenephosphonic acid).

36. The method of claim 25 wherein said phosphonate is 1-hydroxyethylidene-1,1-diphosphonic acid, or a salt thereof.

37. The method of claim 25 wherein said phosphonate is tetrasodium 1-hydroxyethylidene-1,1-diphosphonic acid.

38. The method of claim 25 wherein said phosphonate is hexamethylenediaminetetra(methylenephosphonic acid), or a salt thereof.

39. The method of claim 25 wherein said phosphonate is hexapotassium hexamethylenediaminetetra(methylenephosphonic acid).

40. The method of claim 25 wherein said phosphonate is diethylenetriaminepenta(methylenephosphonic acid), or a salt thereof.
41. The method of claim 25 wherein said phosphonate is hexasodium diethylenetriaminepenta(methylenephosphonic acid).
42. The method of claim 25 wherein at least one phosphonate comprises less than about 10% by weight of said composition, based on total ammonium polyphosphate composition.
43. The method of claim 25 wherein at least one phosphonate comprises in the range of about 1% to about 10% by weight of said composition, based on total ammonium polyphosphate composition.
44. The method of claim 25 wherein at least one phosphonate comprises about 4.35% by weight of said composition based on total ammonium polyphosphate composition.
45. The method of claim 28 wherein said rheological modifying agent is at least one selected from a group consisting of guar gum, derivatized guar gum and xanthan gum.
46. A method of suppressing wildland fires comprising aerially applying to wildland vegetation a fire suppressing composition comprising:
 - water; and
 - the corrosion-inhibited fire retardant composition of claim 1.
47. The method of claim 46 wherein said azole is at least one azole selected from a group of azoles including tolytriazole, benzotriazole, mercaptobenzothiazole, dimercaptomthiadiazole, 1,2 benzisothiazoline-3-1, 2-benzimidazolone, 4,5,6,7-tetrahydrobenzotriazole, tolylimidazole, 2-(5-ethyl-2-pyridyl) benzimidazole, phthalimide, any alkali metal salts thereof and combinations thereof.

48. The method of claim 46 further comprising at least one additive selected from a group of additives consisting of coloring agents, surfactants, stabilizers, rheological modifiers, opacifying pigments, and any combination thereof.

49. The method of claim 46 wherein said corrosion inhibitor is at least one azole and said azole is present in said corrosion-inhibited fire retardant composition, in concentrate, in a minor amount effective to obtain a corrosivity of yellow brass to a maximum of 5.0 mils per year, as determined by the "Uniform Corrosion" test set forth in Section 4.5.6.1 of "Specification 5100-304b (July 1999) Superseding Specification 5100-00304a (February 1986)," entitled "Specification for Long Term Retardant, Wildland Fire, Aircraft or Ground Application," issued by the United States Department of Agriculture, Forest Service.

50. The method of claim 48 wherein said coloring agent is at least one selected from a group consisting of fugitive coloring agents, non-fugitive coloring agents and pigments, extenders, opacifying pigments, and other highly colored coloring agents.

51. The method of claim 46 wherein said suspending agent is at least one suspending agent selected from a group of suspending agents consisting of Attapulugus clay, Sepiolite, Fuller's earth, Montmorillonite, and Kaolin clays.

52. The method of claim 46 wherein said corrosion inhibiting system is comprised of at least one soluble corrosion inhibiting compound and at least one insoluble corrosion inhibiting compound.

53. The method of claim 46 wherein said corrosion inhibiting system is present in a minor amount effective to reduce the corrosiveness of said fire retardant composition, in concentrate, to at least one of a maximum corrosivity of aluminum to 5.0 mils per year, brass to 5.0 mils per year, and steel to 5.0 mils per year, as determined by the "Uniform Corrosion" test set forth in Section 4.5.6.1 of "Specification 5100-304b (January 2000) Superseding Specification 5100-

00304a (February 1986)," entitled "Specification for Long Term Retardant, Wildland Fire, Aircraft or Ground Application," issued by the United States Department of Agriculture, Forest Service.

54. The method of claim 46 wherein said corrosion-inhibited fire retardant composition comprises in the range of about .01% to about 10.0% said corrosion inhibiting system.

55. The method of claim 46 wherein said corrosion-inhibited fire retardant composition comprises in the range of about .30% to about 6.0% said corrosion inhibiting system.

56. The method of claim 46 wherein said corrosion-inhibited fire retardant composition comprises in the range of about .60% to about 5.0% said corrosion inhibiting system.

57. The method of claim 48 wherein said rheological modifier is at least one selected from a group consisting of guar gum, derivatized guar gum and xanthan gum.

58. A method of inhibiting corrosion comprising providing a corrodible material and contacting said corrodible material with the corrosion inhibited composition of claim 1.

59. The method of claim 58 wherein said azole is at least one azole selected from a group of azoles including tolytriazole, benzotriazole, mercaptobenzothiazole, dimercaptomthiadiazole, 1,2 benzisothiazoline-3-1, 2-benzimidazolone, 4,5,6,7-tetrahydrobenzotriazole, tolylimidazole, 2-(5-ethyl-2-pyridyl) benzimidazole, phthalimide, any alkali metal salts thereof and combinations thereof.

60. The method of claim 58 wherein said corrosion inhibited composition is comprised of at least one soluble corrosion inhibiting compound and at least one insoluble corrosion inhibiting compound.

61. The method of claim 58 wherein said corrosion inhibited composition further comprises at least one additive selected from a group of additives consisting of coloring agents, opacifying pigments, surfactants, stabilizers, rheological modifiers, and any combination thereof.

62. The method of claim 58 wherein said corrodible material is at least one material selected from a group of corrodible materials consisting of steel, brass and aluminum.
63. The method of claim 58 wherein said corrosion inhibited fire retardant further comprises water.
64. The method of claim 58 wherein said suspending agent is at least one suspending agent selected from a group of suspending agents consisting of Attapulugus clay, Fuller's earth, Montmorillonite, Sepiolite and Kaolin clays.
65. The method of claim 58 wherein said phosphonate is aminotri(methylenephosphonic acid), or a salt thereof.
66. The method of claim 58 wherein said phosphonate is pentasodium aminotri(methylenephosphonic acid).
67. The method of claim 58 wherein said phosphonate is 1-hydroxyethylidene-1,1-diphosphonic acid, or a salt thereof.
68. The method of claim 58 wherein said phosphonate is tetrasodium 1-hydroxyethylidene-1,1-diphosphonic acid.
69. The method of claim 58 wherein said phosphonate is hexamethylenediaminetetra(methylenephosphonic acid), or a salt thereof.
70. The method of claim 58 wherein said phosphonate is hexapotassium hexamethylenediaminetetra(methylenephosphonic acid).
71. The method of claim 58 wherein said phosphonate is diethylenetriaminepenta(methylenephosphonic acid), or a salt thereof.
72. The method of claim 58 wherein said phosphonate is hexasodium diethylenetriaminepenta(methylenephosphonic acid).

73. The method of claim 58 wherein at least one phosphonate comprises less than about 10% by weight of said composition, based on total ammonium polyphosphate composition.

74. The method of claim 58 wherein at least one phosphonate comprises in the range of about 1% to about 10% by weight of said composition, based on total ammonium polyphosphate composition.

75. The method of claim 58 wherein at least one phosphonate comprises about 4.35% by weight of said composition based on total ammonium polyphosphate composition.

76. The method of claim 61 wherein said rheological modifier is at least one selected from a group consisting of guar gum, derivatized guar gum and xanthan gum.

77. The method of claim 61 wherein said coloring agent is at least one selected from a group consisting of fugitive coloring agents, non-fugitive coloring agents and pigments, extenders, opacifying pigments, and other highly colored coloring agents.

78. A corrosion-inhibited agricultural plant nutrient comprising:

at least one agricultural plant nutrient;

at least one suspending agent;

at least one phosphonate selected from a group consisting of

aminotri(methylenephosphonic acid), 1-hydroxyethylidene-1,1-diphosphonic acid,

hexamethylenediaminetetra(methylenephosphonic acid),

diethylenetriaminepenta(methylenephosphonic acid), salts thereof, and mixtures thereof; and

a corrosion inhibiting system comprised of at least one corrosion inhibiting compound selected from a group of corrosion inhibiting compounds consisting of azoles, insoluble ferric pyrophosphate, soluble ferric pyrophosphate, ferrous oxalate, ferric citrate, ferrous sulfate, ferric ammonium citrate, insoluble ferric orthophosphate, soluble ferric orthophosphate, ferric ammonium oxalate, ferric ammonium sulfate, ferric bromide, ferric sodium oxalate, ferric

stearate, ferric sulfate, ferrous acetate, ferrous ammonium sulfate, ferrous bromide, ferrous gluconate, ferrous iodide, ferric acetate, ferric fluoroborate, ferric hydroxide, ferric oleate, ferrous fumarate, ferrous oxalate, ferrous oxide, ferric lactate, ferric resinate and any combination thereof;

wherein said corrosion inhibiting system is present in a minor amount effective to substantially reduce corrosiveness of said agricultural plant nutrient.

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